bio-protocol Preprint

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Computational design of antibody nanocages (AbCs)

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An abbreviated version of this protocol was published in Science in Apr 2021

Designed proteins assemble antibodies into modular nanocages

DOI: 10.1126/science.abd9994

Detailed protocol

This protocol provides instructions for running WORMS to generate antibody cage backbones using WORMS' helical protein fusion and geometry check functions.

1. Set up a local copy of WORMS (helical fusion software)
   - Follow the instructions at https://worms.readthedocs.io/en/latest/installation.html
   - More information can be found at http://doi.org/10.5281/zenodo.4441201 and https://github.com/willsheffler
   - Note that pyrosetta is required for setting up your WORMS environment: https://github.com/willsheffler/worms/blob/1.0.1/environment.yml
2. Download the example antibody cage fusion scripts at http://doi.org/10.5281/zenodo.4599680
   - This file contains a readme.txt file with an explanation of its contents.
3. Using a terminal, cd into the worms_setup_examples directory.
4. Update the paths in t32.sh to your worms python path (installed in step 1).
   - This should look like: OMP_NUM_THREADS=1 PYTHONPATH=/path/to/worms /path/to/your/python -m worms @t32.flags
   - Note that there is an errant " at the end of the current t32.sh file that needs to be deleted.
5. To execute this antibody cage fusion run, type in the terminal: ./t32.sh
6. To design other cage geometries, update the t32.flags file following the comments at the bottom of the file.
7. To add or remove building blocks, adjust the txt files in the databases directory.
8. To run Rosetta sidechain design/packing on the WORMS fusion outputs, follow the instructions in the design_example directory.

How to cite:(Readers should cite both the Bio-protocol preprint and the original research article where this protocol was used)

1. Divine, R. and Baker, D. (2021). Computational design of antibody nanocages (AbCs). Bio-protocol Preprint. bio-protocol.org/prep1017.
2. Divine, R., Dang, H. V., Ueda, G., Fallas, J. A., Vulovic, I., Sheffler, W., Saini, S., Zhao, Y. T., Raj, I. X., Morawski, P. A., Jennewein, M. F., Homad, L. J., Wan, Y., Tooley, M. R., Seeger, F., Etemadi, A., Fahning, M. L., Lazarovits, J., Roederer, A., Walls, A. C., Stewart, L., Mazloomi, M., King, N. P., Campbell, D. J., McGuire, A. T., Stamatatos, L., Ruohola-Baker, H., Mathieu, J., Veesler, D. and Baker, D.(2021). Designed proteins assemble antibodies into modular nanocages. Science 372(6537). DOI: 10.1126/science.abd9994